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ABSTRACT

A three-part empirical study analyzed (1) the communication structure of a university faculty, (2) faculty roles, and (3) factors and dimensions of faculty perceptions. In the first phase, 389 faculty members at a large southwestern university responded to three questionnaires mailed at intervals to determine respondents' sex, academic degree, years of service, ethnic group, and departmental affiliation. Respondents also indicated regular full-time faculty with whom they communicated as well as the importance and frequency of the communication link. A low rate of response (39%) contributed to the overall picture of university faculty in their relationship to the campus network. Results indicated that the large majority of faculty were not interested in the communication structure of the university at large and reflected hostility to the investigator for invasion of privacy. The second phase subjects, 81 faculty members who responded to a questionnaire about faculty roles, differed significantly in their views of departmental jurisdiction and governance. Findings suggest that code sharing may be the major problem in university faculty relationships--thus producing difficulty in providing serious contexts for gaining experiences in intercultural encounters and physically entering the territories of other disciplines emerged. The third phase, an 81-item questionnaire measuring interdisciplinary communication attitudes, was answered by 162 faculty members. Results indicated that communication as an interdisciplinary activity was commonly viewed negatively as a function of physical, social, and political barriers. Overall findings suggest that the university is a place where disciplinary specialization has made synergy difficult--a dysfunctional condition for what futurists regard as a growing need in human society for organizational synergy to effectively address global problems. (Appendixes, which comprise nearly half the document, include tables of data, a sample questionnaire, and references.) (NKA)

HIGHER EDUCATION AS A COMMUNICATION SYSTEM

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ABSTRACT

This empirical study provides a description of the communication structure of a university faculty and an analysis of the faculty roles and the factors and dimensions in their perceptions. The information forms the basis for a discussion of the problems which inhibit the development of the faculty network into a synergistic network of superintelligence for the use of society in confronting unprecedented, enormous, global problems.

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HIGHER EDUCATION AS A COMMUNICATION SYSTEM

1. THE COMMUNICATION STRUCTURE

A body of literature in futuristics indicates that world social problems are not now being addressed except in a segmental and partial way through the individual discipline organized as a department in the university (Deethardt, 1985). The single discipline is the bug's-eye, not the bird's-eye view that omits a full explanation of the total situation. The entrenchment of departments leads to specialization and compartmentalization of knowledge, and serious intellectual discontinuities (Calabro, 1980) which are not serviceable in the face of great imbalances of food and energy in the world problematique--"an enormous tangle of problems in sectors such as energy, population and food which confront us with unexpected complexity" (Botkin, Elmandjra, & Malitza, 1978, 4). The enormity of the problematique is testified to by Philip (1980): "Most experts now admit that problems relating to food, fuels, raw materials, poverty, unemployment, inflation, population, pollution, urbanization, technological growth, etc., considered earlier in narrow national or regional terms, call for global remedies. No single nation or group of nations, however advanced, possesses capabili-

ties or resources for solving such problems, independently of the contributions of others" (p. 133). Likewise, no single discipline possesses the capabilities or resources for solving such problems. The search for global remedies for global problems bears directly upon attempts to have our most important intellectual resource, university academics, think globally. Belknap and Kuhns (1977) draw the direct parallel: "Here, then, is the proper use for a great university to provide the cross-criticism that can force narrow groups to bring their minds to bear afresh upon problems about which they have become complacent" (p. 34).

The university organization as a system is a collection of functions which traditionally has embraced (1) the whole range of intellectual disciplines, (2) teaching and research of faculty members, (3) graduate school and undergraduate colleges, and (4) the applied professions (Parsons, 1974). The list contains no synthesis function holding any prospect of <u>synergy</u> in the impact of higher education on learners or on society. Synergism is not a mechanism nor controlling agent but "refers to co-operative effects of all kinds--effects that cannot be produced by the parts or individuals acting alone....Synergism refers specifically to combinatorial effects" (Corning, 1983, 81). Synergy has not been, but can be, and some say should be, institutionalized.

Synergy is probably a function of the communication system or network. How frequently, it can be asked, do faculty members participate in the communication system and how important is it to them? What communication problems prevent the university organization from achieving optimal network development?

1.1 PROCEDURES

The first task for investigation sought to describe the communication network among 997 faculty members in 67 departments and schools at a large southwestern university in the Spring of 1984. Staff members and the medical school were excluded. Questionnaires were mailed three times at about two week intervals, asking for information about sex, degree, years of service in the department, college, or school, ethnic group, and departmental affiliation. The task set for respondents was to list the names of regular, full-time faculty with whom the respondent communicated and to estimate the importance and the freguency of the communication link. Importance was set on a four-point scale (1=unimportant; 2=slightly important; 3=important; 4=very important), and frequency was also set on a four-point scale (1=once/twice monthly; 2=once/twice weekly; 3=several times weekly; 4=once/twice daily). Those estimates were used as weights for each link reported (Richards, 1983).

The communication structure is a network of communicative interactions among faculty. The structure is used to characterize faculty as synergy-prone or non-synergy-prone and discover the implications of those findings for interdisciplinary communication. Network analysis is a method for assessing communication links which are reciprocated, unreciprocated, or absent altogether. As one might guess, some people in the academic organization are connected in the communication structure almost exclusively within their own academic subculture. Others are connected across subcultures. The latter are synergy-prone individuals, while the former may be deemed non-synergy-prone. The reported links were submitted to analysis using the NEGOPY network analysis program (Richards & Rice, 1981) which classifies subjects in distinct categories based on patterns of interconnection.

NEGOPY specifies the roles which faculty can play. The roles are of two general types, participants and non-participants. Four grades of isolates (nonparticipants) are identified: Role #1, those having no links (I-NO); Role #2, those having one link (I-ONE); Role #3, those having a single reciprocated link (isolated dyad: I-DY); and Role #4, those having a single link to a participant and having some number of other isolates attached to them in limb, branch, and twig fashion (Tree node: I-TREE). The participants make up the bulk of a network. They compose three types of participation, two liaison types and the "groupie" partici-

pants. Role #5, direct liaisons, type one (L-DIR), interact with members of groups, but not with members of any one group. Role #6, indirect liaisons, type two (L-INDIR), have less than half of their interactions with members of groups, and usually most of their links with other liaisons. Role #7, group members (GRP) interact with others of the same group (Richards & Lindsey, 1979, 65).

1.2 RESULTS

Of the 998 faculty members in the intact system, only 413 responded, of which 389 (39%) were useable. However, the NEGOPY network analysis program includes an option to add the missing halves; forced reciprocation was used for this analysis. The parameter settings are shown in TABLE 1

One assumption in this study is that the FREQUENCY weight is an indicator of the proximity of two people in a reported link and that proximity is also an indicator of homophily (Rogers & Kincaid, 1981, 131). Thus the FREQUENCY weight can stand for the social (cultural) aspects of communication. Another assumption is that the IMPORTANCE weight is not bounded by frequency, proximity or homophily and can stand for organizational (political) aspects of communication in the faculty network. TABLE 1 shows parameter settings which weigh frequency (P35, Y-COEFFICIENT) more heavily than importance (P34, X-COEFFICIENT). A second processing simply reversed the two settings to weigh importance more

heavily than frequency. In both runs, the names and identification numbers of all faculty, both respondents and non-respondents, had to be included. TABLE 2 provides the processing statistics together with the structure solutions which resulted from the network analysis. Richards' structure is "the proportion of triangles (that is, linked triads) occurring in a system, to the number of such triangles that are possible" (Rogers and Kincaid, 1981, p. 147).

1.3 FACULTY NETWORK ROLES

The output of primary interest in this research is the roles that can be assigned to faculty members in the network. Role identifications can then be used as independent variables. GRP members interact mostly with members of the same group. The parameter setting for this criterion (P28) defined group members as having slightly more than half of the links within one group. A group had to have at least three members and a path of connectedness from each member to each of the other members. The group must also meet the critical node and the critical link criteria. The L-DIR liaisons have most of their interaction with members of groups in general, but not with members of any one group. They link groups. L-INDIR liaisons have less than half of their interaction with group members and most of their links with other liaisons. They link liaisons. Chairpersons and members of interdisciplinary research teams are probably good examples

of L-DIR liaisons, while top level administrators, such as deans and vice presidents, may be good examples of L-INDIR liaisons. Thus GRP may be monocultural, or culture-bound, participants; L-DIR liaisons may be conceived as multicultural persons; L-INDIR liaisons are marginal (political) persons; isolates may be examples of a failed marginality (described in Lum, 1982, and Adler, 1982).

Liaisons have been found to have a greater heterogeneity for information exchange, a quality related to innovativeness in adopting changes and equivalent to "synergy-proneness", in the view of this investigator. "Research on 'the strength of weak ties'...implies that individual integration is negatively related to learning about new information" (Rogers and Kincaid, 1981, p. 179). Liaison persons probably have weaker ties than GRP. Conversely, the GRP people "are more likely to possess the same information, and so any given message is more likely to be redundant" (Rogers and Kincaid, 1981, p. 180). At least, their connectedness will tend to make GRP more non-synergy prone.

The social-cultural milieu in departments requires participants to be acculturated in the codes of the discipline; strong ties of verbal and nonverbal sharing form the disciplinary culture. GRP people possess the same information sources and general knowledge encoded in the jargon of the field. Those with weak ties to the discipline, the liaisons,

are synergy-prone participants in an intercultural network and have developed capabilities of sharing across the code-barriers for interdisciplinary and not just political purposes. Furthermore, university scholars are usually generators of knowledge and for that reason may not be the usual network participant (GRP types). GRP participants bound by frequency of communication within their own departments may generate knowledge only to be exchanged in the "invisible college" of the journals and conventions of their disciplines, not in the synergistic relationships on their own campuses. TABLE 3 shows the results of the analysis, first, by weighting frequency higher, and second, by weighting importance higher. The isolates, non-respondents to the questionnaire, remained the same individuals in both runs. Of the 997 faculty in the organization, 193 non-respondents could not be linked by forced reciprocation to any of the 389 respondents. Imbedded within that number are probably other groups of participants and isolates which remain unknown. Generally, 11.1% of the faculty (FREQUENCY condition) can be classed in roles of the liaison type, and 5.0% are liaisons in the other condition (IMPORTANCE).

The clusters of faculty forming groups are equivalent to the departmental affiliations of the FREQUENCY groups in fifteen cases. (See TABLE 4) Several conglomerate groups are aggregations of all the departments which did not achieve separate identity probably because the interlacing

of network pathways is so complex that none of those disciplines in the conglomerates could be removed without violating the criteria by which groups are formed and tested in the NEGOPY process of gradual, iterative convergence.

The conglomerates among the FREQUENCY groups (#3 and #12) are very large groups. Group 3 is composed of faculty clusters from 43 departments. Group 12 has clusters of faculty from 25 departments from all colleges. Faculty clusters split nine departments overlapping the two conglomerate groups; six are high prestige and three are lower prestige departments (Deethardt, 1986). The other clusters form two small interdepartmental groups. The two conglomerates and the two small interdepartmental groups imply cross disciplinary interaction. Among these FREQUENCY groups, conglomerate #3 has 55 liaisons who are affiliated with the departments represented in the group. But regardless of departmental affiliation, the group members are directly linked, without benefit of liaisons, to form the group. The 55 liaisons have weak ties to the conglomerate group. An extremely small percentage of the links is directed to the liaisons, as seen in Table 5 and Table 6 below. The other conglomerate has 28 liaisons loosely affiliated. TABLE 5 shows the link analysis for the first conglomerate, and TABLE 6 shows the link analysis for the second conglomerate. The fifteen intradepartmental clusters of faculty are a string of independent islands, apparently sufficient unto

themselves in the ocean of university communication weighted for frequency (homophily and proximity).

1.4 DISCUSSION

Only 39% of the faculty responded through three rounds of solicitations. The low response contributes to the picture of university faculty in their relationship to the network on campus. Considering that their evaluation for merit salary raises, tenure and promotion are based in no small part on their understanding of, and productivity in knowledge generation and service, the low response rate is an interesting fact. The large majority of the faculty are not interested in the communication structure of the university at large, outside of their own departmental culture, are ignorant or suspicious of it, or are in some cases, hostile to the idea or to the investigator for invading what they regard as their privacy. One would have expected more interest and understanding.

The number of linked triads in the faculty communication structure was 29% of the total number possible. That may be a proportion too small to meet the goals of synergistic development. There exists no basis of comparison to a model university communication structure. (The inventor of the structure statistic hopes that future studies will use the statistic as a standard of comparison.)

Liaison types, who have synergy-prone characteristics, are rare in this network. The proportion seems too low to achieve the ends of interdisciplinary communication.

Faculty clusters equivalent to departments are independent social entities which may be tied to "invisible colleges" for new information and are probably strong, non-synergy-prone, monocultural entities with low potential for innovativeness in interdisciplinary communication.

The faculty cluster in the conglomerate group is probably interdependent synergy-prone faculty with higher potential for participation in innovative relationships for synergistic communication.

L-OIR faculty are multicultural and could provide leadership for interdisciplinary innovations. L-INDIR faculty are probably tied too closely as marginal persons to the formal administrative (political) structure to be concerned with interdisciplinary innovations. Very few isolates responded to the questionnaire. Those few who did wrote brief polemics bespeaking their alienation.

The small interdepartmental groups are probably very busy with specific interdisciplinary projects. They may be able to transfer their intercultural experience to new situations outside of their habituated loyalties.

2. COMMUNICATION FACTORS

The assigning of network roles to the faculty members who returned questionnaires completed one phase of this investigation. The next phase is to look into the communication factors arising from the different network roles of faculty to answer questions about the problems preventing optimal development of the university communication system.

2.1 PROCEDURES

Both categories of liaisons (N=69) were singled out, omitting those so classed by forced reciprocation who had not returned the communication structure questionnaire. For each liaison role, a GRP was selected which appeared to match the L-DIR or L-INDIR in sex, degree, years in the department, department affiliation, and college affiliation. Some were "perfectly" matched but in many cases the number of years did not match. The one with the nearest number of years to the liaison was selected from the group members. Only in a few cases was the investigator required to go outside the liaison's departmental affiliation to find a match. In such cases an attempt was made to choose a department of similar prestige ranking (by quartile) and disciplinary methodology (e.g., within science, within engineering, or within humanities) from which to make a match. The final list included 69 matched pairs of faculty members, together with the ten isolates (N=148). The disciplinary-cultural,

synergy-prone L-DIR liaisons and the organizational, synergy-prone L-INDIR liaisons were matched with the monocultural, non-synergy-prone GRP for the purpose, first, of understanding the factors distinguishing among faculty predispositions playing a role in the network, and, second, of generating simple, concise statements descriptive of the communication of the role each represents.

The matched subjects were sent a questionnaire entitled Faculty Roles in the Communication Network. (See APPENDIX.) The instrument contained 54 items to which bi-polar response choices along a five-point scale were to be made. The 24 items, five through 28, were the same as items 31 through 54. The only difference was in the instructions. For the first set, respondents were told: "Please estimate the degree to which you have had problems in communicating with faculty in disciplines other than your own because of...." That instruction puts the respondent in the interdisciplinary condition. The directions for the second set of items were the same except that "with faculty within your own discipline" was substituted in the appropriate place. That direction put subjects in the intradisciplinary condition. The instrument also required respondents to write some concise statements characterizing their communication with faculty within the department and also with faculty in other departments/disciplines.

2.2 RESULTS

Of the 148 faculty members sent questionnaires, 81 responded (54%). Generally, the characteristics of the respondents in both the L-DIR/L-INDIR and the GRP categories are similar. (See TABLE 7) They represent 27 departments on campus, 12 of which are represented on both lists. Five departments are unique to L-DIR/L-INDIR and ten are unique to GRP. Inspection of TABLE 7 reveals the comparison of respondents in the categories of sex, degree, college and prestige quartile. Except for departmental affiliation, the two samples are similar enough to conclude that the chief variation in the two samples is to be found in the communication roles of the respondents previously determined. The two types of liaison roles were collapsed into one category (L) because the rarity of liaison types prevented the analysis of data distinguishing the two. There were only eleven L-DIR liaisons and 27 L-INDIR liaisons in the 81 respondents. (Only three of ten isolate-types responded and are represented in the 81 total.)

T-tests of differences between the means of L-DIR and L-INDIR were significant (two-tailed probability) for four items in the interdisciplinary condition, as follows:

1. "ambiguous departmental jurisdictions" ($t[35.07]=2.28$, $p=.029$)
2. "inability to perceive parallels" ($t[31.28]=2.07$, $p=.047$)

3. "differences in departmental governance" (t[31.02]=2.27, p=.031)
4. "lack of understanding of basic concepts and philosophy of your discipline" (t[32.09]=2.10, p=.044)

For each item, the L-DIR respondents indicated fewer problems than the L-INDIR respondents. While both means are on the "no problem" side of the 5-point scale, the L-DIR tend to be less troubled by problems of departmental jurisdiction and governance, and perceiving parallels between concepts and philosophy of disciplines. The L-DIR works closer to the boundaries of disciplines. The L-INDIR probably works less directly with boundaries between disciplines and may not treat them with the respect which departmental faculty require.

Evidence of differences between the L and GRP samples is manifest in the item analysis of the instrument. T-tests of differences between means for all items show differences between L and GRP faculty significant (two-tailed probability) only for three of 54 items, as follows:

1. "differences in faculty remuneration" (t[61.71]=-2.11, p=.039) in the intradisciplinary condition
2. "differences in terminology" (t[72.89]=-2.37, p=.02) in the intradisciplinary condition
3. "inability to speak a common language" (t[73.30]=2.21, p=.03) in the interdisciplinary condition

On the "common language" item, L (M=2.42) tended to work in the direction of more problems than GRP (M=1.92) although both groups responded on the "no problems" end of the scale. However, on the "terminology" item, L (M=1.57) tended to respond with "no problems," and GRP (M=2.05), though still on the "no problem" end, had more problems than L. Intradepartmental terminology was a more sensitive issue for GRP, and interdisciplinarians are concerned with finding a common language. The remuneration issue was more of a problem to GRP (M=2.02) than to L (M=1.5); faculty pay may be an issue related to faculty proximity, homophily and frequency of interaction. Faculty are probably more sensitive to differences within their own department than to those between departments.

With those few differences noted, an analysis was made of the factors to be found in the 54 items. The SPSS factor analysis program was used, and the standard criteria (cutting off analysis at a minimum level of eigen value, 1.0, and having at least two items load above .600 on one factor and no more than .400 on the rest) were applied. A varimax rotation was requested. Thirteen factors were obtained, but only eight factors met the criteria. The eight factors accounted for 88.8% of the variance. (See Table 8)

Each of the eight factors represents a problem area of communication in the campus network, but a method of simple

inspection was used to determine which factors bore significance for understanding interdisciplinary communication. The items on the assessment instrument were cast in terms of lacks, absences, differences, that is, in generally negative terms, but the mean scores on all the items contributing to the factors are located from one to three on the "no problems" side of the five-point scale. There were "dissident" subjects on the "many-problems" side of the scale for every item, but they were usually outweighed by the preponderance of opinion which varied between the neutral and the satisfied stance. It appears that the "dissident" opinion usually pulled the items into a factor when their number increased beyond the usual five to seven people on each item. Some items loaded high because they were so heavily marked as "no problem" areas, such as, for example, the tenure and rank items. Therefore, the third factor, Rank and Tenure Differences, is a political problem, not a disciplinary nor an interdisciplinary communication problem. The distribution of scores for the items on Factor III appears in TABLE 9, which illustrates the selection method.

Comparing the average number of subjects on both sides of the scale mid-point indicates that, for factor III, the overwhelming weight of opinion finding no problems with the tenure and rank differences in inter- or intra-disciplinary communication should convince the interpreter that that factor can be ruled out in a search for differences that make

interdisciplinary communication a problem. The same reasoning process applied to the other factors reveals that only three factors out of the nine define the problems of interdisciplinary communication. Not to be considered are factors I, III, IV, V, and VI. (See TABLE 10)

The "problems" factors are II (Serious Discussion Contexts), VIII (Specialized Language), and IX (Strength of Cross-disciplinary Ties), in the collective opinion of faculty answering the "Faculty Roles" questionnaire. Factor IV (Specialization Interference), approaches the possibility of inclusion. In regard to specialized language, Littlejohn (1982) points to an important barrier that hinders criticism of many types within and across disciplines, semantic differences between fields and subfields. He says, "Almost always, different fields use different labels for the same or similar concepts. So the comparative critic must be a flexible reader, who looks beyond traditional disciplinary labels to understand concepts" (p. 277-78). On the other hand, two disciplines may use the same label for different concepts. For example, the word "value" for the professor of economics has a meaning quite different from that for a professor of intercultural communication.

2.3 DISCUSSION

L-INDIR is probably a marginal, organizational-chart type. L-DIR probably has a special affinity for intercultural (interdisciplinary) communication. L-DIR and L-INDIR differ significantly in their views of departmental jurisdiction and governance. The latter operate more in the formal (political) structure and are more sensitive to jurisdictions, governance, and disciplinary philosophies.

L have a significant concern with sharing a common language across disciplinary boundaries, and GRP are more sensitive to differences in terminology within their own discipline. L are "levelers" and cultural interpreters, while GRP are "sharpeners".

Code sharing may be the major problem in university faculty relationships. The factors which are particular problems in interdisciplinary communication point to difficulties in code sharing, providing serious contexts for gaining experiences in intercultural encounters, and strengthening ties to other disciplines by physically entering the territories of other disciplines.

3. DIMENSIONS OF INTERDISCIPLINARY COMMUNICATION

In the questionnaire, Faculty Roles in the Communication Network, faculty were asked to write two concise statements characterizing their communication with other faculty mem-

bers, first, within their own departments and, second, outside their own departments. Several hundred statements (N=329) were generated. From that pool, 81 items were filtered out by eliminating obvious duplications, incomplete ideas, and otherwise incomprehensible contributions.

The 81 items were submitted to the faculty (N=998) in May, 1985, through campus mail. Evaluating each item on a five-point agree-disagree scale (1=strongly agree, 5=strongly disagree), 162 faculty provided useable responses. The procedure of factor analysis was used to discern the dimensionality of the construct. While sample size does not appear to fit the ideal in the best recommendation of McCroskey and Young (1979, p. 377) for a sample of approximately 200, which should produce reasonably stable correlations and reduce the impact of non-significant correlations on the results, the sample is deemed to have adequate variability because of its stratified nature and to be representative of the population.

The inductive approach means that no a priori definition or expectations for the construct existed. Items were written by representatives of the population of professional academicians.

Factors of interest were selected by finding those which had more than one item loading no less than .600 on a primary dimension and a secondary factor loading no greater than

.400. Factors were rotated using the Varimax option in the SPSS Factor Analysis program.

3.1 RESULTS

A solution for twenty-five factors (where the eigenvalue dipped below 1.00) was requested. Four factors met the criteria of choice. They accounted for 50.5% of the common variance (with nine, one-item "dimensions"). Four-, ten-, and fifteen-factor solutions gave similar results. (The four-factor solution accounted for 81.5% of the common variance on the first two factors, whose items are identical to those of the twenty-five factor solution. The twenty-five factor solution merely allows the consideration of two additional factors meeting the criteria of choice.)

The four factors contributing to an understanding of the construct are interpreted as follows. The first is an evaluative dimension, the second is an activity dimension, the third indicates time constraints, and the fourth indicates topic constraints. (See Table 11)

Factor I has nine items which can be divided into two, negative and positive categories of "evaluation". The five items of Factor II, called "activity", make observations on communication behaviors, opportunities for communication, and barriers to communication such as physical distance. The observations all report negative activity, the reduction of activity to social and political irrelevancy.

The constraints described in Factors III and IV are also negative statements. Time constraints were phrased apologetically, and respondents apparently recognized and believed that industriousness within one's own department regretfully prevents interdisciplinary action. The topics of discussion appear to swing between the two extremes of global and parochial significance in order to facilitate communication across disciplines. The too broad and the too narrow topics suggest a third and missing category of topics of optimal, cross-disciplinary significance. These two factors, taken together, indicate a "potency" factor that characterizes intedisciplinary communication as being weakened by constraints of topic and time.

3.2 DISCUSSION

The analysis of factors in the faculty statements about "synergistic communication" appears to have "discovered" by an inductive process the major dimensions of the construct, and that finding has seemed to replicate the three major factors in Osgood, Souci and Tannenbaum's (1957) studies of semantic space. Like them, this study finds similar weights of the factors of common variance and a large portion of the variance spread over factors of specific variance all operating to define the construct.

Faculty make positive and negative evaluations of their interaction within the department. Network participants

probably make both negative and positive statements. Isolates probably make only negative statements. Group participants probably make more positive evaluations than liaison participants who may have dissatisfactions that make them seek significant interactions outside the department.

Communication as an interdisciplinary activity is commonly viewed negatively as a function of physical, social, and political barriers. Other constraints have weakened the potential of cross-disciplinary interaction. The isolates have taken themselves out of the faculty dialogue and live in alienation from the network. The liaison participants must overcome much negativity which hinders the large majority of group participants from activity and involvement with other disciplines on campus. Faculty groups are mostly departmental and disciplinary groups which work and squabble among themselves; that's where the action is and that's where the rewards are.

4. SUMMARY

The results of this investigation of the faculty communication structure, differences between faculty network roles, and factors in interdisciplinary communication lead to the judgment that the university is a place where the intellectual resources of society constitute a modern Tower of Babel, where the many tongues of disciplinary specializations have made synergy difficult. That condition is dysfunctional

for what futurists regard as a growing need in human society for organizational synergy, especially in the universities, so that enormous, global problems can be effectively addressed.

Appendix A

QUESTIONNAIRE: FACULTY ROLES IN THE COMMUNICATION NETWORK

DIFFERENT FRAMES OF REFERENCE

(No Problems) 1 2 3 4 5 (Many Problems)

FRAGMENTED KNOWLEDGE

(No Problems) 1 2 3 4 5 (Many Problems)

INABILITY TO PERCEIVE PARALLELS

(No Problems) 1 2 3 4 5 (Many Problems)

IMPAIRED OR INEFFECTIVE LISTENING SKILLS

(No Problems) 1 2 3 4 5 (Many Problems)

INABILITY TO COMMUNICATE IN SMALL TASK-ORIENTED GROUPS

(No Problems) 1 2 3 4 5 (Many Problems)

DIFFERENCES IN DISCIPLINARY PRESTIGE WITHIN THE UNIVERSITY

(No Problems) 1 2 3 4 5 (Many Problems)

INHIBITED ATTITUDES

(No Problems) 1 2 3 4 5 (Many Problems)

ABSENCE OF CONTEXTS FOR FRANK, SERIOUS DISCUSSION

(No Problems) 1 2 3 4 5 (Many Problems)

ABSENCE OF DESIRE FOR SERIOUS, FRANK DISCUSSION

(No Problems) 1 2 3 4 5 (Many Problems)

DISCIPLINARY NARROWNESS

(No Problems) 1 2 3 4 5 (Many Problems)

CONFLICT BETWEEN DISCIPLINES

(No Problems) 1 2 3 4 5 (Many Problems)

DIFFERENCES IN TERMINOLOGY

(No Problems) 1 2 3 4 5 (Many Problems)

AMBIGUOUS DEPARTMENTAL JURISDICTIONS

(No Problems) 1 2 3 4 5 (Many Problems)

DIFFERENCES IN FACULTY RANK

(No Problems) 1 2 3 4 5 (Many Problems)

DIFFERENCES IN FACULTY REMUNERATION

(No Problems) 1 2 3 4 5 (Many Problems)

DIFFERENCES IN FACULTY TENURE

(No Problems) 1 2 3 4 5 (Many Problems)

DIFFERENCES IN DEPARTMENTAL GOVERNANCE

(No Problems) 1 2 3 4 5 (Many Problems)

INABILITY TO SPEAK A COMMON LANGUAGE

(No Problems) 1 2 3 4 5 (Many Problems)

LACK OF SIMILARITY IN THE FACILITIES ONE IS ACCUSTOMED TO

(No Problems) 1 2 3 4 5 (Many Problems)

CRONYISM OR LOYALTY TO OTHER INDIVIDUALS OR DEPARTMENTS

(No Problems) 1 2 3 4 5 (Many Problems)

FAVORITISM OF ONE DISCIPLINE OVER ANOTHER

(No Problems) 1 2 3 4 5 (Many Problems)

LACK OF A SYMPATHETIC ATTITUDE OF A FACULTY MEMBER TOWARD YOUR OWN METHODS AND OBJECTIVES OF FUNCTIONING IN TEACHING OR RESEARCH

(No Problems) 1 2 3 4 5 (Many Problems)

LACK OF UNDERSTANDING OF BASIC CONCEPTS AND PHILOSOPHY OF YOUR DISCIPLINE

(No Problems) 1 2 3 4 5 (Many Problems)

UNWILLINGNESS TO GIVE/TAKE THE TIME REQUIRED FOR DISCUSSION

(No Problems) 1 2 3 4 5 (Many Problems)

Does your discipline have a specialized vocabulary and nomenclature which must be understood in order to discuss your subject matter?

NOT AT ALL 1 2 3 4 5 YES, TO A GREAT EXTENT

To what extent is an understanding of the special language in your discipline by faculty in other disciplines necessary for you to communicate effectively across disciplines about world problems?

TOTALLY UNNECESSARY 1 2 3 4 5 ABSOLUTELY NECESSARY

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TABLE 1

Control Parameter Settings

PARAMETER	MEANING	VALUE	COMMENT
1	(NUMBER OF NODES)	998	**USER**
2	(LOWEST NODE)	2	**USER**
3	(NUMBER OF LINKS)	78000	**USER**
4	(NAME WIDTH)	20	**USER**
5	(RECIPROCATION)	1	**USER**
6	(UNRECIP MIN)	1	**USER**
7	(MEAN STREN SET)	0	**USER**
8	(DIRECTION)	0	**USER**
9	(NO OF WEIGHTS)	2	**USER**
10	(MULTIPLE LINKS)	0	**USER**
11	(LINKS/CARD)	7	**USER**
12			
13			
14	(NUMBER RAW PRINT)	10	**USER**
15	(LINK DESCRIBE)	2	**USER**
16	(ISOLATE DESCRIBE)	2	**USER**
17	(DENSITY HIST)	0	**USER**
18	(DESCRIBE TESTS)	0	**USER**
19	(GROUP DESCRIBE)	1	**USER**
20	(FILE OUTPUT)	1	**USER**
21	(MONITOR)	0	DEFAULT
22			
23			
24	(NUMBER OF ITERS)	4	DEFAULT
25	(SCAN RADIUS)	200	DEFAULT
26	(GRP SENSITIVITY)	100	**USER**
27			
28	(% WITHIN GRP)	50.010	DEFAULT
29	(MINIMUM SPLIT)	12.000	DEFAULT
30	(SPLIT SD)	30.000	**USER**
31	(DROP SPLIT)	0.100	DEFAULT
32			
33	(LINEAR CONSTANT)	0.0	**USER**
34	(X-COEFFICIENT)	1.000	**USER**
35	(Y-COEFFICIENT)	2.000	**USER**
36	(CP X CONSTANT)	0.0	DEFAULT
37	(CP Y CONSTANT)	0.0	DEFAULT
38	(X*Y COEFFICIENT)	0.0	DEFAULT
39	(REAL EXPONENT)	0.0	DEFAULT
40	(INTEGER EXPONENT)	3.000	**USER**
41	(LOW WEIGHT)	1.000	DEFAULT
42	(HIGH WEIGHT)	4095.000	**USER**
43	(2 STEP WEIGHT)	1.000	DEFAULT

TABLE 2

Structure Calculations

Function	Result
No. of Names Read	997
No. of Good Link Reports Read	3979
Unreciprocated Links Dropped	0
Links Added to Force Reciprocation	3222
Links Used in the Analysis	7085
Observed No. of Nodes*	794.
Observed No. of Links	3490.
Observed System Density	.011
Expected No. of Cycles	171.
Maximum No. of Cycles	15385.
Observed No. of Cycles	4648.
Richards' Structure	.2943

*There are 203 isolates not included in the structure calculation.

TABLE 3

Frequencies of Network Roles by Two Weights

Role	Frequency	Importance
Non-Participants		
1 I-NO	101 (4)*	101 (4)*
2 I-ONE	100 (4)*	100 (4)*
3 I-DY	0	0
4 I-TREE	2 (2)*	2 (2)*
Participants		
5 L-DIR	32	16
6 L-INDIR	79	34
7 GRP	683	744
Number of Groups	19	10

*The number in parentheses is the number of subjects who responded to the questionnaire. The remainder were non-respondents.

TABLE 4

Disciplines Composing GRP by Two Weights

FREQUENCY GROUPS	IMPORTANCE GROUPS
1.Speech Communication(9)*	1.Conglomerate(66)*
2.Accounting(14)	2.Conglomerate(159)
3.Conglomerate(309)	3.Mathematics(4)
4.Philosophy(7)	4.Architecture(6)
5.Geoscience(5)	5.Finance(7)
6.Architecture(13)	6.Architecture(4)
7.Architecture(5)	7.Comp. Sci.(3)
8.Mathematics(3)	8.Mech. Engin./ Petrol.Engin.(9)
9.Military Science(4)	9.Conglomerate(482)
10.English(4)	10.Park Admin. & Lands.Arch.(4)
11.Mechanical Engineering(9)	
12.Conglomerate(254)	
13.Speech and Hearing Sciences(10)	
14.Plant and Soil Science(11)	
15.Economics/Anthropology/Physics(14)	
16.Biology/Geosciences/Museum Science(3)	
17.Information Systems and Quantitative Science(3)	
18.Computer Science(3)	
19.Biological Science(3)	

*Number in parentheses is number of faculty in group.

TABLE 5

Link Analysis for Conglomerate (#3)

	Number of Links					Strength of Links
	2-Way	Outgoing	Incoming	Total	%	%
WITHIN GROUP	304	1035	1035	2374	77.84	89.16
BETWEEN GROUP	27	195	200	422	13.84	5.97
L-DIR LIAISONS	7	50	38	95	3.11	1.62
L-INDIR LIAISONS	8	70	81	159	5.21	3.26
TOTAL	346	1350	1354	3050		
%	11.34	44.26	44.39		100.	

TABLE 6

Link Analysis for Conglomerate (#12)

	Number of Links					Strength of Links
	2-Way	Outgoing	Incoming	Total	%	%
WITHIN GROUP	190	764	764	1718	76.19	87.62
BETWEEN GROUP	22	166	174	362	16.05	7.56
L-DIR LIAISON	6	40	40	86	3.81	2.90
L-INDIR LIAISON	5	48	36	89	3.95	1.92
TOTAL	223	1018	1014	2255		
%	9.89	45.14	44.97		100.	

TABLE 7

Comparison of Characteristics of L and GRP Samples

CHARACTERISTIC	L RESPONDENTS (N=38)	GRP RESPONDENTS (N=40)
SEX		
Male	32	35
Female	6	5
DEGREE		
Ph.D.	32	32
M.A.	7	8
COLLEGE		
Agriculture	3	3
Arts & Sciences	29	25
Business Admin.	4	8
Education	1	2
Engineering	1	2
Home Economics	0	0
Law School	0	0
DEPARTMENTAL PRESTIGE QUARTILE		
Highest Prestige	9	12
Second Quartile	16	13
Third Quartile	6	7
Lowest Prestige	7	8

TABLE 8

Eight Factors in Faculty Network Communication Problems (N=81)

FACTOR AND VARIANCE (88.8%)	FACTOR LABEL	FACTOR ITEM		FACTOR LOADING
I (43.9)	Intra-disciplinary attitudes and methods	52.	Lack of sympathetic attitude of a faculty member toward your own methods and objectives of functioning in teaching and research	.71
		53.	Lack of understanding of basic concepts and philosophy of your discipline	.71
		51.	Favoritism of one discipline over another	.66
		48.	Inability to speak a common language	.65
		36.	Differences in disciplinary prestige	.63
		37.	Inhibited attitudes	.61
		43.	Ambiguous departmental jurisdictions	.61
		41.	Conflict between disciplines	.60
II (13.4)	Serious Discussion Contexts	38.	Absence of context for frank, serious discussion (WITHIN)	.84
		39.	Absence of desire for serious, frank discussion (OUTSIDE)	.81
		12.	Absence of context for frank, serious discussion (OUTSIDE)	.73
		13.	Absence of desire for serious, frank discussion (OUTSIDE)	.67
		54.	Unwillingness to give/take the time required for discussion	.63

III (9.3)	Rank and Tenure Differences	46.	Differences in faculty tenure (WITHIN)	.77
		44.	Differences in faculty rank (WITHIN)	.75
		18.	Differences in faculty rank (OUTSIDE)	.70
		20.	Differences in faculty tenure (OUTSIDE)	.70
IV (7.7)	Specialization Interfering with Interdisciplinary Communication	5.	Different frames of reference	.75
		6.	Fragmentary knowledge	.71
		7.	Inability to perceive parallels	.65
V (5.0)	Departmental Loyalty	24.	Cronyism or loyalty to other individuals or departments	.72
		25.	Favoritism of one discipline over another	.68
VI (3.8)	Specialization Interfering with Intradisciplinary Communication	33.	Inability to perceive parallels	.67
		32.	Fragmentary knowledge	.63
		31.	Different frames of reference	.62
VIII (3.1)	Specialized Language	29.	Specialized vocabulary and nomenclature in the discipline necessary for discussion	.68
		30.	Special disciplinary language necessary to communicate across disciplines	.65
IX (2.6)	Strength of Cross-Disciplinary Ties	2.	Strength of ties to faculty in other disciplines	.73
		3.	Visits to buildings of other faculty	.69

TABLE 9

Factor III: Distribution of Scores

Item #	Mean	Frequency Distribution of SS Item Responses 1	2	3	4	5	(n)
46	1.85	43	18	11	7	2	= 81
44	1.87	42	20	9	7	3	= 81
18	1.60	52	16	7	5	1	= 81
20	1.60	53	15	7	4	2	= 81
TOTAL		190	69	34	23	8	
AVERAGE # of SS		47.5	17.2	8.5	5.7	2.	= 80.9
		64.7			7.7		

TABLE 10

Eight Factors Compared for Score Distributions

Factor #	Average # of SS On "No Problems" Side	Average # of SS at Scale Mid-Point	Average # of SS On "Many Problems" Side
I	57.1	10.8	12.9
II*	40.6	18.4	21.8
III	64.7	8.5	7.7
IV	47.6	26.3	16.9
V	55.0	13.0	13.0
VI	50.9	17.0	13.0
VIII*	35.5	22.0	24.0
IX*	34.0	21.5	25.5

*Problem-defining factors.

TABLE 11

Factors in the Construct

FACTOR I. Evaluation Dimension (29.6% Variance)

Factor Loadings	Item
A. Positive	
-.815	I have excellent communication with the members of my department.
-.775	Communication with colleagues in my own discipline is multilevel, ranging from professional to social, and leading to frequent and open communication.
-.755	Communication among my colleagues is good.
-.719	In our department, we have a high degree of professional commitment, personal comaraderie, and similarities in philosophy of life, which bind us together and which elicit frequent communication.
B. Negative	
.800	The department as a whole has trouble communicating with each other.
.772	We have a departmental environment that fails to stimulate the intellect.
.696	I do not share a common frame of reference with many of my colleagues in the department.
.659	Talking to many members of my department is a complete waste of time; they do not want to hear what I have to say, and I do not want to hear what they have to say.y.
.604	Communication with other faculty within my department is hampered by mutual feelings of competition.

FACTOR II. Activity Dimension (11.1% Variance)

.799	My communication with faculty in other disciplines or departments is practically non-existent except for off-campus social events.
.670	There is no forum for shared communication, except on a political basis, which I am not particularly interested in.
.670	I communicate very little with faculty in colleges other than my college.
.644	Cross-disciplinary communication is virtually non-existent largely due to spatial segregation of persons from different

disciplines.

.618 There is not too much communication with other disciplines, other than coffee and chit-chat.

FACTOR III. Time Constraints (5.4% Variance)

.737 It's hard to make time just to visit and talk with other people in other departments.

.654 Often I feel so busy that I must focus narrowly on my own concerns in order to do a good job.

FACTOR IV. Topic Constraints (4.4% Variance)

-.830 Topics of discussion tend to be more global in communication across disciplines.

.674 Topics of discussion tend to be more parochial in communication across disciplines.